CHALMERS


# Extension of the EU Emission Trading System to maritime transportation

## Assessing the perception and impacts on the European container shipping industry

Bachelor thesis for International Logistics Program

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DEPARTMENT OF MECHANICS AND MARITIME SCIENCES

CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sweden, 2024

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# PREFACE

During the third and final year within the International Logistics program at Chalmers University of Technology, this bachelor thesis was written by the authors Joel Heljemo and Daniel Larsson. A total of 180 credits were required for the bachelor´s degree, of which 15 credits come from this thesis. We want to express our gratitude to our supervisors Christopher Thomassen and Olle Lindmark for their guidance during the project. We also want to thank all the companies and their representatives who took their time participating in the interviews performed in this study. Their willingness to participate and their informative and thought-provoking answers was what made this study possible. The environmental issue is arguably the largest issue of our time and that is the reason behind our interest for the topic our study is based upon. We believe and hope our study will give some valuable insights within the subject area and lead to a greater understanding of the opportunities and challenges that lie ahead.

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# SAMMANDRAG

Trots att containersjöfarten anses utgöra ryggraden av global handel, och vara en av de största medverkande till globala utsläpp, står containersjöfarten inför betydande utmaningar när det gäller att implementera hållbara energipraxis. För att bekämpa denna situation, och ge incitament för sjöfarten att bli mer hållbar, har vissa initiativ införts, där EU ETS har framträtt som ett internationellt initiativ. Med fokus på aktörer verksamma inom europeiska vatten, utvärderar denna studie EU ETS-regelverkets potentiella effekter på den europeiska containersjöfarten, hur den uppfattas av aktörer inom branschen, samt att fastställa regelverkets övergripande effektivitet i att reducera utsläpp av $CO_2$. Genom intervjuer med internationella rederier och andra aktörer samlades insikter in för att ge en djupare förståelse för de utmaningar och möjligheter som uppstår genom införandet av EU ETS inom sjöfarten. Resultaten av denna studie antyder att aktörer inom den europeiska containersjöfarten är positiva till regelverk som EU ETS, där den generella uppfattningen var att något behövde göras för att bemöta dessa typer av frågor. För det andra föreslås det att konkurrensen mellan sjöfart och andra transportmedel förmodligen kommer bli oförändrad, åtminstone på en global skala. För det tredje finns det antydningar om att rederier kan använda metoder för att undvika EU ETS, såsom att optimera rutter och överföra den extra kostnaden till befraktare. EU ETS ses som ett potentiellt svar på att minska kostnadsgapet mellan fossila och alternativa bränslen, men denna studie indikerar att det finns skäl att ifrågasätta regelverkets övergripande effektivitet och dess förmåga att uppfylla sitt mål.

**Nyckelord:** EU ETS, sjötransport, containersjöfart, bränslekostnader, hållbarhet, utsläpp, fartygsbränslen, modal konkurrens, påverkan.

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# ABSTRACT

While being a cornerstone in global trade and being one of the larger contributors to global emissions, container shipping is facing substantial challenges in terms of adopting sustainable energy practices. To combat this current landscape, and provide incentives for the shipping industry to become more sustainable, some initiatives have been introduced, where the EU Emission Trading System (EU ETS) has surfaced as one of these international initiatives. With a focus on actors active within European waters, this study evaluates the EU ETS regulation's potential effects on the European container shipping industry, how it is perceived by actors within the industry, as well as determining its overall effectiveness in reducing $CO_2$ emissions. Through interviews with international shipping companies and other knowledgeable actors, insights were gathered to provide a greater understanding of the challenges and opportunities arising from the extension of the EU ETS within maritime shipping. The findings of this study imply that actors within the European container shipping industry are positive to regulations such as the EU ETS, and evidently, that something was needed to be done to address these types of issues. Secondly, it is suggested that the competitive landscape between maritime and other modes of transportation will most likely not be altered, at least on a global scale. Thirdly, there are implications that shipping companies may utilize methods to avoid the regulation, such as optimizing routes and transferring the additional cost to shippers. The EU ETS is seen as a potential answer to reducing the cost gap between fossil and alternative fuels, but this study indicates that there are reasons to question the regulation's overall effectiveness and its ability to reach its goal.

Keywords: EU ETS, maritime shipping, container shipping, fuel costs, sustainability, emissions, shipping fuel, modal competition, impacts.

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# ACRONYMS AND TERMINOLOGY

| | |
|---|---|
| DWT | Deadweight Tons |
| ECA | Emission Controlled Area |
| EC | European Commission |
| EEA | European Economic Area |
| EU ETS | European Union Emission Trading System |
| FEU | Forty-foot Equivalent Unit |
| GHG | Greenhouse Gas |
| GJ | Gigajoule |
| GT | Gross Tonnage |
| HSFO | High Sulphur Fuel Oil |
| SWOT | Strengths, Weaknesses, Opportunities and Threats |
| TEU | Twenty-foot Equivalent |

# 1. INTRODUCTION

Despite efforts from actors within maritime shipping to facilitate sustainable energy practices, maritime shipping remains one of the larger contributors to the global emissions of carbon dioxide ($CO_2$). While maritime shipping is considered to be one of the more environmentally friendly modes of transport in terms of emissions per cargo unit, given the immense size of the shipping industry, maritime shipping is estimated to account for 3% of total global emissions of $CO_2$ (Nusa & Kodak, 2023). Because of this, various initiatives and regulations have been adopted and implemented to combat these emissions and facilitate long-term sustainability. Among these initiatives, the European Commission (EC) proposed the extension of the European Union Emission Trading System (EU ETS) to the maritime sector, and it is now official that it will be gradually implemented in the maritime sector starting from January 2024 divided into multiple phases during the following years to come (European Commission, n.d.b). The EU ETS was first established in 2005 and is described as an essential part of the European Union´s climate policy in combating $CO_2$ emissions from polluters, where polluters are subject to pay for their emissions (European Commission, n.d.a). When new regulations are introduced, there will always be certain challenges for the actors that they affect, whether it is getting knowledge about the regulation, compliance with the regulation but also financial and strategic challenges.

## 1.1 Background

With the increasing demand for long-term sustainability across the world, it is now more important than ever for actors within the shipping industry to accelerate the green energy transition, and in that regard, facilitate sustainable shipping practices. Fortunately, there have been technological developments regarding the availability of sustainable and renewable energy sources, i.e. sustainable fuels that can help accelerate and facilitate the green energy transition in shipping. However, despite technological readiness, there are persistent challenges such as financial obstacles which are the costs of transitioning from conventional to sustainable fuels (Law et al., 2021).

To address this issue, the EU ETS may emerge as a way of counteracting this particular problem. By holding polluters financially accountable for their emissions, the EU ETS may provide a factor that may force actors in the container shipping industry to adopt more sustainable fuels. By doing so, the price discrepancy between fossil and sustainable fuels may be reduced, making it economically justifiable for companies within the sector to make the switch (European Commission, n.d.b). Although the EU ETS has been applied in other modes of transport, research directly conducting its impact on container shipping remains somewhat limited. With that in mind, it is of great essence to assess the perception that the European container shipping industry has on the EU ETS, what the impacts of the regulation will have on the industry, as well as determining its overall effectiveness in reducing $CO_2$ emissions.

## 1.2 Aim of the study

The purpose of this study is to evaluate the effectiveness of reducing emissions of $CO_2$ and the impacts of the EU ETS regulation within the European container shipping industry and to find out how actors in the industry perceive the EU ETS. A few of the effects include evaluating how the EU ETS's inclusion of maritime transportation may affect pricing and strategies as well as possible changes in competition between maritime transportation and other modes of transportation.

## 1.3 Research questions

How is the EU ETS perceived by actors within the European container shipping industry?

How may the EU ETS affect competition with other modes of transport?

What effects will the EU ETS have on container shipping and how effective will the regulation be to reduce $CO_2$ emissions?

## 1.4 Delimitations

The delimitations for this study include assessing companies whose vessel fleet calls to ports in Europe and within the European Economic Area. While the theories and literature compiled are not limited to any specific country, this study exclusively considers the impacts and perceptions from and on stakeholders active within European waters. The interviews have been made with international shipping companies and with knowledgeable representatives from their respective Swedish offices. By delimiting the scope of the research, a more thorough evaluation of the challenges within the specific industry can be conducted.

# 2. THEORY

This chapter commences with an exploration of theoretical knowledge relevant to the subject. The theoretical knowledge collected from books and other literature includes general theory about container shipping, the dynamics of competition among different transportation modes, and key determinants influencing shipping prices. Subsequently, the chapter transitions to a showcase of prior research related to the scope of this study, surrounding aspects such as fuel prices, the history of the EU ETS, possible impacts on maritime shipping as well as a general overview about what is stipulated in the EU ETS regulation in regards to maritime shipping.

## 2.1 Container liner shipping

As an industry, the container shipping industry consists of shipping companies whose main activities are transporting containerized goods by sea using liner services. Liner services can be defined as a fleet of ships that provides a fixed service between pre-determined ports, where the ships sail according to a published schedule. This means that vessels will depart according to the schedule regardless if the vessel has been fully loaded or not in terms of cargo utilization. Within container liner services, the cargo that is transported is constricted to a limited range of standardized units, the TEU (Twenty-foot Equivalent Unit) and the FEU (Forty-foot Equivalent Unit) are the most common out of the standardized units. However, occasionally slightly different container units are also used (Talley, 2012).

### 2.1.2 Short-sea shipping

Short-sea shipping, operating within regional boundaries, serves as a means to distribute cargo delivered to regional hubs such as Rotterdam in Europe by deep-sea vessels and then to smaller ports. The short-sea shipping sector is in direct competition with land-based transportation modes such as rail, showcasing a distinct industry from deep-sea shipping. Typically, vessels in the short-sea shipping segment are smaller, ranging from 400 to 6000 DWT (Deadweight Tons), although there are no strict size limitations. Short-sea shipping encompasses a variety of goods including containers but also other types of cargo such as grain, lumber, coal and steel. In addition to deep-sea shipping, short-sea services are becoming increasingly crucial, particularly for the distribution of containers from major hubs such as Rotterdam. The expansion of these services have been rapid, driven by deep-sea operators adopting larger vessels and minimizing port calls, opting instead to distribute goods from main ports to smaller ports. Furthermore, there is a notable increase in cargo movement between local ports, in response to efforts by regional authorities, especially in Europe, aimed at reducing congestion. While many short-sea trades rely on smaller vessels, growing cargo volumes have caused many shipping companies to utilize a broader range of ships, including ships with a capacity of 1,500 TEU to 2,000 TEU, and in some cases even larger. (Stopford, 2008).

## 2.2 Factors affecting pricing and rates in shipping

Many shipping companies' pricing decisions often originate from responses to incentives within the business environment. Within transportation, this environment consists of various stakeholders, notably the market in the form of customers, governments and competitors. Shipping companies are subject to adapt to shifts and directives originating from their operational surroundings, and occasionally these adjustments may not be advantageous for the carriers, for example when regulations from governments force shipping companies to change their operational procedures. Nevertheless, these environmental influences will significantly influence pricing strategies and price structures for the carrier (Novack et al.,

2018). Ocean freight rates are known to be highly volatile, often experiencing significant fluctuations over a short time period. Consequently, shipowners and shippers encounter challenges in estimating transportation costs, and this volatility has remained consistent over the years with instances of both exceptionally low and remarkably high freight rates since the year 2000 (Talley, 2012).

## 2.3 Modes of transportation

Choosing the right mode of transportation is crucial as it determines the speed and efficiency in movements of cargo throughout the supply chain. While road-, rail-, maritime-, air- all serve the fundamental purpose of transporting goods within the supply chain, the practical choices for global transportation are typically restricted. Factors like the capabilities and costs of each mode, as well as the characteristics of shipments, need to be carefully evaluated (Novack et al., 2018).

### 2.3.1 Sea transportation

Sea transport is regarded as the slowest out of the four modes of transportation and provides transportation between ports and not directly to and from the supplier's and customer's facilities. However, sea transportation excels in providing the lowest operating cost per ton-kilometer in almost all situations, which is one of the key strengths with sea transportation. Another key strength for sea transportation compared to other modes of transportation is the significantly higher load capacity as well as having low costs for infrastructure, given by the fact that the waterways are normally free of charge. With that in mind, sea transportation has its greatest competitive advantage for transporting low-value cargo over long distances where sea routes are available (Jonsson & Mattsson, 2016).

### 2.3.2 Rail transportation

Transportation by rail is a preferred choice for moving space-consuming and low-value cargo across extensive distances. Virtually all types of commodities can be efficiently transported with rail due to the railway carriages' ability to adapt. Nonetheless, due to its prolonged transit times, transporting high-value goods by rail will result in substantial capital tie-up, therefore it is less ideal for such cargo types. One of rail's most significant competitive advantages is its ability to transport large volumes without emitting direct emissions. Additionally, it stands out as the most energy-efficient mode of transportation (Jonsson & Mattsson, 2016).

### 2.3.3 Road transportation

When it comes to road transportation, road-bound truck traffic is the most common way to conduct both short and long-distance freight transport. It is essentially the only mode of transportation that can offer direct deliveries from the supplier's to the customers facility. Its relative advantages are therefore greatest when transporting to a dispersed market. Other modes of transportation typically move goods between terminals and can only, in exceptional cases, offer deliveries to supplier's or the customer's facilities. Moreover, almost any type of cargo can be transported anywhere using road transportation. Factors such as size, weight and transport distance are less important for the ability to transport on road, this is because it is almost always possible to tailor a transport route for a single delivery as long as there is a drivable road available. In most cases, road transportation has its main competitors in air transportation for high-value cargo in small volumes and with rail transportation when it comes to large volumes of low-value cargo. Road transportation can be a competitive option for both short and long transportation distances, but is still not as competitive as sea- and rail transportation for low-value cargo in terms of cost advantages (Jonsson & Mattsson, 2016).

## 2.4 Balancing costs and sustainability

When it comes to fuels and the associated challenges for fuels in shipping, shipping fuels are generally viewed as one of, if not the largest cost component for shipping companies, and in many cases, the fuel costs for a shipping company can make up over 50-60% of the operational costs for vessels (IEA, 2020). With the costs of bunker fuel being one of the largest for a shipping company, deciding what type of bunker fuel to use becomes significantly critical for a shipping company. Traditionally, high-sulphur fuel oil (HSFO) has been the primary choice of shipping fuel due to its lower upfront costs compared to cleaner alternatives (Fridell, 2019). As illustrated in Figure 1 there is a significant difference in the price ranges between fossil fuels, biofuels and synthetic fuels in terms of price per energy content. For example, when comparing the fuel price per gigajoule (GJ), the highest price for high-sulphur fuel oil (HSFO) was approximately 11 USD/GJ. In comparison, the highest price for synthetic fuels such as ammonia was approximately 61 USD/GJ. In other words, the price for ammonia was roughly six times more expensive for the same amount of energy content. With that in mind, it has been challenging to stimulate the consumption of cleaner fuels in the absence of previous frameworks and incentives to reduce emissions and use low-carbon fuels (IEA, 2020). However, with the growing pressure on the shipping industry to reduce its $CO_2$ emissions, more stringent environmental regulations such as the EU ETS are now being put in place as a way of forcing shipping companies to reassess their fuel choices and bridge the cost gap between fossil fuels and cleaner alternatives.

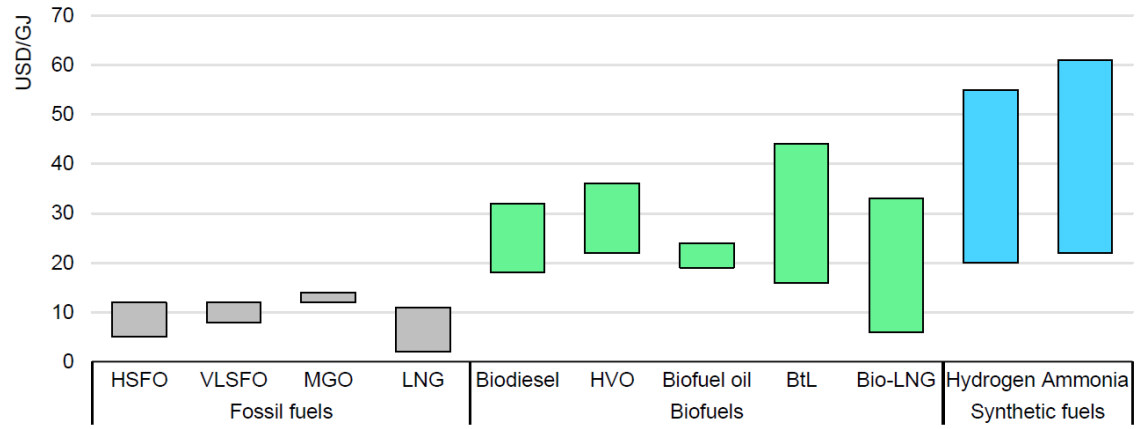


**Figure 1.** Cost ranges for shipping fuels (IEA, 2020). CC BY 4.0

## 2.5 European Emission Trading System (EU ETS)

The European Emission Trading System (EU ETS) is a legislative framework established in 2005 to reduce emissions of greenhouse gas (GHG) to counteract climate change. As a system, the EU ETS relies upon a cap and trade principle operating for all EU countries, including Iceland, Norway and Liechtenstein. This cap and trade principle aims to reduce emissions of GHG by setting a limit on GHG emissions, and the cap is reduced annually to meet the European Union's climate targets. The cap is expressed in so-called "emission allowances" where one allowance permits the emission of one tonne of carbon dioxide equivalent, and every year, companies need to submit these allowances to account for their emissions (European Commission, n.d.a). Inside the cap, companies can buy allowances and trade allowances in cases where it is needed, and with the cap decreasing every year, this will assure companies of enduring the scarcity of the allowances, which will help guarantee the market value of the allowances. The price of the allowances serves as an incentive for companies to reduce their emissions. As a result, it will dictate the revenue generated by the EU ETS through allowance sales. In return, the revenue that the EU ETS generates is distributed to EU members' national budgets where the members can allocate the revenue towards various initiatives and innovations that promote renewable energy, enhanced energy efficiency and low-carbon technologies (European Commission, n.d.a).

When it comes to the scope of the EU ETS, as previously mentioned, the EU ETS applies to all member states in the EU including states such as Iceland, Liechtenstein and Norway and the framework covers emissions of GHG from approximately 10,000 installations in the energy sector and manufacturing industry (European Commission, n.d.c).

## 2.6 Extension to maritime transportation

While an essential tool in facilitating global trade, maritime transportation has long been under the radar when it comes to comprehensive international regulations compared to other modes of transport. In recent years, the European Union set a goal to achieve climate neutrality within the union by 2050, and to achieve this goal it has been established that GHG emissions must decrease by at least 55% by 2030 compared to 1990. To have a clear path towards the 2030 goal, the European Commission formulated proposals collectively referred to as the "Fit for 55". The Fit for 55 is a package containing various instruments that seek to reduce emissions of GHG, where one of the primary components of the package is the extension of the EU ETS to maritime shipping (Vierth et al., 2024).

When it comes to maritime transportation specifically, in practice, the EU ETS will extend and cover emissions from vessels that are larger than 5,000 Gross Tonnage (GT) entering EU ports, no matter what flag a vessel has. In more detail, the system will cover 50% of emissions from voyages that start or end outside the EU, as well as 100% of the emissions for voyages between two EU ports, which means that shipping companies are obligated to purchase and submit EU ETS emission allowances for every tonne of $CO_2$ that is emitted. To create a smooth and seamless transition for the maritime sector, shipping companies are only obligated to submit a set fraction of their emissions during the initial phase of the extension of EU ETS to maritime shipping. For 2025, shipping companies only have to submit allowances for 40% of their emissions reported in 2024, for 2026, 70% of their emissions in 2025 and from 2027 and ahead, 100% of their reported emissions (European Commission, n.d.b).

## 2.7 Prior research

This subchapter presents prior research about the EU ETS, its history, and its potential impacts on pricing within the maritime sector.

### 2.7.1 History of the EU ETS and its implications for shipping

In a study called "The prospects for, and implications of, emission trading in shipping" by Christodoulou and Cullinane (2023), the authors provide a SWOT analysis that evaluates the potential implementation of the EU ETS in the shipping industry. Furthermore, the paper offers a qualitative assessment of the historical progression of discussions and measures taken worldwide by the International Maritime Organization (IMO), and on a regional scale within the EU (Christodoulou & Cullinane, 2023).

One conclusion from the study by Christodoulou and Cullinane (2023) is that discussions have been underway for many years regarding potential market-based measures (MBM) to induce efforts in reducing emissions of GHG from the maritime industry. While the progress towards implementing a global ETS through the International Maritime Organization (IMO) has been somewhat limited, there has been a significant advancement, especially in the EU where the integration of maritime shipping now since the start of 2024 has been implemented in the EU ETS. When it comes to the impacts of the EU ETS on the shipping industry, the study concludes that the introduction of the EU ETS for the shipping industry would create significant drivers in expediting investments in green technologies and alternative fuels. Due to the increase in operational costs resulting from the necessity to obtain emission allowances induced by the EU ETS, the study argues that this would encourage investments equivalent to these costs. Another conclusion that the study presents is that given the strong correlation between these investments, it is imperative that the additional carbon costs are high enough in order to encourage significant investments such as in energy efficiency or alternative fuels. As a result of this, there will be incentives for companies to minimize the additional cost induced by the EU ETS while still progressing in sustainability and still being competitive in the respective market. Furthermore, the constant increase in the price of emission allowances during the following years due to the decreasing EU ETS cap, the authors argue this will accelerate the adoption of long-term sustainability strategies within shipping companies which will eventually lead to reduced $CO_2$ emissions in the shipping sector (Christodoulou & Cullinane, 2023).

### 2.7.3 Impacts on pricing

When it comes to consequences on the pricing of shipping-related services, multiple studies have been conducted on the EU ETS impact regarding economic aspects. In a study by Christodoulou et al. (2021), the results from the study show that shipping companies will experience a direct impact by being included in the EU ETS as their operational costs will rise with the added $CO_2$ costs incurred by obtaining sufficient amounts of emission allowances to account for their emissions. The extra expense for emission allowances will act as a catalyst for investments in cleaner technologies and fuels, but the results from the study show that this can only be made possible if shipping companies are unable to transfer the cost to their shippers (Christodoulou et al., 2021).

In a report from Mellin et al. (2020), the authors provide some further insight into the additional costs associated with EU ETS where authors argue that the impacts will depend on the market conditions. The results in the report conclude that depending on the market conditions, the additional cost caused by the EU ETS may be passed on to shippers and later

on from shippers to consumers. The market conditions can be described as different periods in which the demand and supply for maritime services and ships fluctuate. During periods when the demand for maritime services is low compared to the availability of ships, freight rates will be set to minimal operational expenses. But as emission allowance costs become a part of the voyage costs, they will raise the minimal operational costs and consequently the freight rates that shippers have to pay. Additionally, when the demand for maritime services exceeds the supply of ships, freight rates will be dictated by shippers' marginal benefits, increasing the price they are willing to pay for these services. This means that the additional cost associated with emission allowances will instead fall upon the shipowner or operator and not the suppliers, which may incentivize shipowners and operators to adopt measures to mitigate emissions by enhancing energy efficiency of their fleet both through technical and operational enhancements (Mellin et al., 2020).

# 3. METHODS

This chapter outlines the methodology used in this study, including the research strategy, types of data used, collection of data, respondents involved, ethical aspects and an analysis of the data collected.

## 3.1 Research strategy

The research strategy for this study involved performing a case study on the perceptions and impacts that the EU ETS will have on European container shipping. A case study is a research strategy that narrowly focuses on one or very few instances of a certain circumstance, for example, an event, relationship or experience. As a concept, the case study grants the researcher the ability to use both qualitative and quantitative data and other means of investigating, such as interviews, observations, documents and questionnaires (Denscombe, 2014).

## 3.2 Choice of method

There are many different analysis methods a researcher can utilize to describe, use or interpret data. Two of the most common research methods are utilizing either qualitative or quantitative data or a combination of both. The main difference between these two methods is that qualitative data utilizes words or visual images as a base for analysis, while quantitative data uses numbers (Denscombe, 2014). Therefore, to appropriately address the research questions and make a connection to the purpose of this study, it made sense to utilize the qualitative method.

## 3.3 Collection of data

For this study, two different data collection methods were used, these include literature, for the theory chapter, and interviews for the result chapter. Denscombe (2014) suggests that utilizing different data collection methods can greatly improve the precision of the findings. The selection of participants was subjective, meaning that individuals were deliberately chosen based on their expertise in EU ETS and container shipping, with the expectation that they would provide valuable data for the study. Additionally, it was decided that the study would benefit from interviewing different types of companies active in the container shipping industry to receive different perspectives on the same subject matter. This method proves advantageous in studies conducted on a smaller scale and for studies that are constrained by limited time and budget (Denscombe, 2014).

### 3.3.1 Literature overview

The purpose of the theory chapter is to give the reader an overview of what has already been written about the subject of the study and to gain sufficient knowledge to understand the results. The theory chapter was based on prior scientific literature such as reports, review articles, extracts from books/e-books, and articles from academic journals with a fairly strong connection to the themes and topics of this study. Additionally, websites from internationally recognized organizations such as the European Commission were also used to gain some practical information about the topic, i.e. the stipulations in the EU ETS regulation. To ensure a high level of credibility when searching for literature, well-known databases such as Scopus, Google Scholar, ScienceDirect and Chalmers Library were used. When searching within the databases, the keywords were used in multiple different combinations in order to find relevant and credible information. The keywords that were used were: EU ETS, maritime shipping, container shipping, fuel costs, sustainability, emissions, shipping fuel, modal

competition, impacts. When searching for literature in these databases, the authors first selected articles according to certain aspects, these aspects include the currency, relevance, authority, the accuracy and the general impression of the literature. Given the topic of this study, the literature that was found was relatively new which simplified the selection the authors were able to choose from. Regarding the relevance, the relevance to this study was determined by briefly reading the abstracts, discussions and conclusions in the literature. If the literature was relevant, it was checked who had written the literature by looking at the authors and their respective education and experience. If all these criteria were met, the authors of this study performed a thorough reading of the content, and if no significant issues were found, the authors proceeded with including the literature in the theory chapter of this study.

### 3.3.2 Semi-structured interviews

Several actors working with containerized cargo within the shipping industry were contacted to provide insights and answers to questions with a strong correlation to the research questions in this study. The actors that were contacted were representatives from shipping companies, liner agencies and freight forwarders that are active within the container shipping industry. The four respondents that participated in the study can be summarized in Table 1 below, which involves details about the respondent, such as their professional title and the type of company they work at.

| Name | Professional title | Type of company |
|---|---|---|
| Respondent 1 | Head of Sustainability | Liner Agency |
| Respondent 2 | Ocean Freight Director | Freight Forwarder |
| Respondent 3 | Managing Director | Shipping Company |
| Respondent 4 | Country Manager | Shipping Company |

**Table 1.** Respondents in the study

In Denscombe (2014), it is stated that performing interviews is a suitable and rewarding data collection method when the purpose of the research is to examine complicated phenomena such as opinions, thoughts or complex issues. Considering this, conducting semi-structured interviews seemed appropriate for this study, due to the purpose and research questions being strongly correlated with opinions and thoughts. A semi-structured interview is a data collection method where the interviewer has a predetermined list of questions that are to be answered by the respondent during the interview. A semi-structured interview is also recognized as an open-ended method, which means that in terms of the topics that are considered during the interview, the respondent can speak freely on the topics and questions brought up by the interviewer, which made it possible to get further insights about the topic of discussion (Denscombe, 2014).

During the semi-structured interviews, questions concerning the respondents and their companies' perspectives on the EU ETS and what implications it may have for the container shipping industry were asked. All interviews with the respondents were performed online using the communication platform Microsoft Teams, and the interviews typically lasted between 15-30 minutes. During the interviews, both authors of this study were present where half of the questions were asked by each of the authors. Every interview was, with the consent of the respondent, audio recorded, and the audio recording was then later transcribed using the transcription tool in Microsoft Word.

## 3.4 Ethical aspects during the collection of data

In a case study that is done qualitatively, it is of great importance to consider the ethical aspect. All collection of data was done within the guidelines from Chalmers University of Technology (Chalmers, 2022). The respondents that were interviewed were handled anonymously and the data was processed so the answers could not be tracked. The reason for this stems from the perception that the data would not be considered more relevant if the respondents were public. An important point is that the respondents sign an information and consent form, see appendix 2. Such a form was issued where the respondents could give consent to take part in the study and the choice to withdraw from participating in the study at any time. The respondents also gave their consent to record the interview with the purpose of transcribing the material. Given this, the requirements of informed consent are fulfilled according to Chalmers (2022).

## 3.5 Data analysis

According to Denscombe (2014), audio recordings have the need of being transcribed, and the transcription process will help to perform detailed searches and comparisons of the collected data. As previously mentioned, all interviews were audio recorded and later transcribed with the consent of the respondents. The transcriptions of the audio recordings were performed by using the built-in transcription tool within Microsoft Word, which made it possible to automatically compile the response from the interview in a single document quickly after the interview. After transcription, the collected data was thoroughly inspected by comparing the data that the automated transcription provided, with the actual audio recording, to make sure that no data was missing or lost. Simultaneously, errors in spelling and unnecessary words were deleted to make the data easier to read and understand. Additionally, all of the data was then manually translated to English due the interviews being conducted in Swedish, while some terms were translated with the help of Google Translate. After translating the data, the data was then reviewed where the authors highlighted answers that would be most relevant to present in the result chapter in regards to answering to the purpose and research questions of the study. This data was then written into the result section of the study, and later compared with theory and reflected upon in the discussion chapter.

# 4. RESULTS

The result chapter is based on interviews conducted with people in decision-making positions within the chosen companies. The respondents from the interviews have professional titles such as *Head of Sustainability, Ocean Freight Director, Managing Director* and *Country Manager*. The respondents represent different types of companies such as liner agencies, freight forwarders and shipping companies.

## 4.1 Perception of the EU ETS

In this subchapter, the respondents and their customers opinions on the EU ETS as a regulation are presented.

Respondent 1 states that they in their role as Head of Sustainability, see the EU ETS as something positive. It creates an incentive for shipping companies to decrease their emissions and accelerate their ambition towards being more sustainable. Although, the perception of the EU ETS will largely depend on who you are asking, meaning it is dependent on their respective role within a company. With regards to the shippers' perception of the EU ETS, respondent 1 acknowledges that shippers generally are somewhat aware of the regulation and that it may have implications for the shippers distribution costs. For this reason, shippers have shown some interest in understanding how the shipping companies will deal with the regulation (Respondent 1, personal communication, 2024).

Respondent 2 explains that shipping in itself is a very international business involving a lot of international regulations, and where possibly maritime shipping has been able to hide from these international regulations in the past. Respondent 2 says that maritime shipping has previously only been touching the surface of making improvements in sustainability to appear as an environmentally friendly alternative. The respondent further explains that, up until now, the discussion has mostly surrounded ECA (Emission Controlled Area) areas where shipping companies switch their bunker to “cleaner” alternatives when their ships are approaching the coastlines, but when the ships are operating on the open sea, the ships can switch back to more “dirty” alternatives, and that the EU ETS may be a way to counteract this trend. Respondent 2’s impression is that companies within the industry have spoken a lot about becoming more sustainable, but when it comes to actually paying for their part, the willingness has been subpar. However, with the EU ETS, everyone pays their share, which respondent 2 perceives as a really good thing, where you have to pay for what you are actively involved in. Respondent 2 further explains that, given that there is a cap in the EU ETS, shipping companies have an incentive to lower their emissions because it will get gradually more expensive if you do not actively work with it (Respondent 2, personal communication, 2024).

When it comes to the shipper’s perception of the EU ETS, respondent 2 describes that there have always been some complaints as soon as new regulations are in place that directly affects their customers, i.e. the shippers. However, when new regulations are introduced there is quite a lot of information and communication that can be easily referenced. If you start this process in time, respondent 2 says that the customers will not react as strongly and will not be as surprised by the change (Respondent 2, personal communication, 2024).

Respondent 3 states that they are very positive to the EU ETS as a regulation due to the fact that you have to pay for your emissions, and in that regard, hold accountability for emissions. Respondent 3 thinks that the EU ETS will act as an incentive to project change in shipping, as

well as providing a level playing field for actors on the shipping market. However, respondent 3 also mentions that maritime shipping may, due to the EU ETS, become skewed compared to other modes of transport where other modes of transportation such as road transportation is yet to be covered by the regulation, which is something respondent 3 thinks makes the different modes of transportation unsynchronized in terms of emission regulation. When it comes to the shipper's perceptions of the EU ETS, respondent 3 explains that shippers have been keen on understanding how the rates have been calculated, however, respondent 3 states that they as company have not been willing to disclose that type of information.

Respondent 4 says that as a company, they are positive towards the EU ETS as a regulation. Their understanding of the regulation is that it can be compared to a share system, where those that emit must purchase shares corresponding to their emissions and that there is only a certain amount of shares available, which will result in fluctuating prices. Respondent 4 believes that the regulation will put pressure on the shipping companies to become more sustainable, which will be a form of competitive advantage on the market. Furthermore, respondent 4 mentions that it is excellent that something is introduced that directly addresses these types of issues. However, respondent 4 says that the regulation was initially quite vague, where many shipping companies viewed the regulation quite differently. This meant that since the initial pricing release in light of the EU ETS, many shipping companies have modified their respective prices for this particular reason. The shippers and customers perception, according to respondent 4, is that it is largely dependent on the customer. Some shippers and customers are critical towards the price increase and argue that it is not their liability to pay for the shipping company's emissions. Meanwhile, some are very positive and welcoming towards the regulation.

## 4.2 Competition with other modes of transport

This section presents results from when the respondents were asked about if the regulatory framework EU ETS will increase the competition with other modes of transport.

Respondent 1 mentions that with container shipping being the backbone of global trade, container shipping should be relatively unthreatened and difficult to compete with on a global scale. However, feeder vessels that are sailing 100% within the EEA (European Economic Area) from the larger ports in Europe such as Rotterdam and Hamburg to ports such as Gothenburg, Aalborg and Helsinki may potentially be subject to a change due to a higher level of competition in the short-sea shipping sector. Still, feeder vessels normally transport volumes of around 2000 TEU, meaning switching to road is far from viable. Therefore, if a potential shift from shipping to another mode of transport were to happen, it would be rail, although it is unlikely (Respondent 1, personal communication, 2024).

Respondent 2 claims that given the current market conditions, respondent 2 does not perceive other modes of transport such as road and rail as a big threat to container shipping in the light of the EU ETS. However, during the COVID-19 pandemic, respondent 2 says that there were increased amounts of transports by rail to and from Asia, but that this is no longer possible due to the political situation and war in Ukraine. Respondent 2 perceives that a transition away from maritime transport for overseas shipments is not imminent. However, if maritime shipping were to encounter increased competition, it would be for intra-European shipments. Conversely, respondent 2 argues that the EU ETS might actually benefit maritime shipping, as payment is mandatory regardless of the chosen mode of transportation (Respondent 2, personal communication, 2024).

When asked about the competition between maritime shipping and other modes of transport, respondent 3 mentions Germany as an example where the road toll was recently increased to levels that are twice the previous level and that this increase will more or less offset the EU ETS charge charged by shipping companies, essentially creating a zero-sum game. Furthermore, respondent 3 describes that if cargo is to be transported from Europe to Sweden, the cargo will most likely pass through Germany, due to the large volumes of cargo passing through Germany. With that in mind, respondent 3 means that for such transportations, it will become increasingly more tricky to perform these transportations due to the doubled road toll in Germany, which respondent 3 means will be substantial amounts of money.

Respondent 4 says that for the largest shipping companies, there will most likely not be any increase in competition with other modes of transport. However, those who might be affected by the regulation would in that case be short-sea shipping, and more specifically feeders that operate near the coastlines. Additionally, the general consensus is that shipping remains relatively unthreatened due to the increased costs being quite minor on a large scale. However, it is worth mentioning that the regulation is currently in its opening phase, and that you only have to account for 40% of your emissions. As the phases in the regulation progress, the share of emissions to account for will increase, which in the end can cause large impacts financially, if no or very few improvements are made in terms of lowering emissions.

## 4.3 Effects on container shipping and pricing

In this section, the respondents thoughts on different effects that the EU ETS might cause on container shipping and pricing are presented.

Respondent 1 discloses that some clauses, or rather, technicalities within the EU ETS exist in case you sail 100% within the European area, compared to connecting or arriving from ports outside of the European area. Therefore, one can imagine that shipping companies, to a great extent, will most likely try to find ways around the framework to lower their costs. Respondent 1 elaborates that shipping companies may adapt to the EU ETS by having their vessels call to ports outside the EEA, and that this has been applied by some shipping companies already. This can be especially prominent for trade routes such as Southeast Asia to Europe where shipping companies will use nearby ports, for example, the Arabian Peninsula as their transhipment port, instead of using ports in the Mediterranean for corresponding transhipments (Respondent 1, personal communication, 2024).

When asked about potential changes in pricing and surcharges, respondent 1 claims that shipping companies set their prices in quite different ways, but that the general approach will be to embed the cost of the EU ETS within the rates that are provided to customers. In that case, the additional costs associated with the EU ETS will therefore be passed on to the customers. By having the extra cost of the regulation embedded in the rates, the shipping companies will probably not be entirely transparent towards the customers, however, respondent 1 states that the intent is not to deceive the customers but rather to make it as unnoticeable as possible to the customers. Nevertheless, the customers will understand that the additional cost of the EU ETS is included in the price, but the customer will not be aware of the exact calculations behind the rate or how large the surcharge of the EU ETS is. Additionally, respondent 1 states that the extra surcharge passed on to the customers will aim to cover the EU ETS costs for the shipping company, but it is pointed out that it is highly unlikely that shipping companies will try to get a margin on it, because that would push the prices too far (Respondent 1, personal communication, 2024).

When asked about who will be held accountable for the additional cost induced by the EU ETS, respondent 2 says that in the end, it will be the end-consumer that will be paying for the additional cost. Moreover, respondent 2 hopes and believes that the EU ETS will be a good starting point in terms of combating emissions and that it is important for the rest of the world to follow the initiative. Given the fact that the EU ETS is only applicable within Europe, it would be beneficial for other regions and countries to implement something similar, instead of only concentrating on a certain trade that may or may not be as large as other trades. The EU ETS regulation will force actors to take responsibility, which will result in shifts in technology. Respondent 2 explains that the dilemma today is to make use of alternative fuels, that there has to be sufficient infrastructure and supply, which may or may not be available at locations where you want it to be. While there are alternative fuels currently available on the market that reduce emissions, the primary issue with these have been their prohibitively high prices. However, this is something that is currently being worked on, and the EU ETS may be a way of accelerating this process. Respondent 2 claims that to be competitive during contract negotiations, you have to show that you are actively working and addressing the issue, for example in financial statements, which is something relatively new that has received more attention than before. This can be seen in procurement processes where a lack of alternative solutions can result in disqualification (Respondent 2, personal communication, 2024).

When asked about implications for container shipping and pricing, respondent 3 hopes that regulations such as the EU ETS can be learnt from and hopefully be applied in regions other than only the EU and that it can become a global standard for regulating emissions. Respondent 3 claims that regulations such as the EU ETS are important and will encourage shipping companies to make use of more sustainable fuels and accelerate the ambition of investing in new technologies. When asked about the increased cost induced by the EU ETS, respondent 3 states that the additional costs associated with the EU ETS will be passed on to the customers and that it will be embedded in the freight rates, rather than having long specifications of all the surcharges and add-ons in that contribute to the freight rate provided to the customer.

Regarding who will be paying for the increased costs caused by the EU ETS, respondent 4 states that it will be the end-customer that will be paying for the price increase, the price is updated every quarter and it is non-negotiable for the customer. However, some customers may have a fixed price per container during a year, although customers with this type of arrangement are few. Respondent 4 further mentions that they believe it is important to be transparent towards the customer, meaning that for their company, the additional cost caused by the EU ETS will be clearly visible on the invoice, so the customer can get an understanding of the additional cost they are paying for. However, respondent 4 emphasizes that they as a company have no intentions of making profit out of the situation caused by the regulation, rather, break even when it comes to the additional cost caused by the regulation.

Regarding the implications for container shipping as a whole, respondent 4 explains that the European region is often at the forefront in terms of sustainability goals. Due to the fact that respondent 4 and their shipping company have an ambition to operate with more sustainable vessels in the near future, the ambition is to be able offer a lower price than their competitors. In terms of strategies, respondent 4 mentions that during the introduction of the regulation, some operators altered their routes and instead of calling to European ports, called to nearby non-EU ports, such as ports in the United Kingdom. However, respondent 4 means that most

of the speculations were present during the early stages, and that most loopholes have, to the best of their knowledge, been sorted since then.

# 5. DISCUSSION

In this following chapter, the authors discuss the findings of the study in comparison to the theory as well as commenting and discussing the method that was chosen for the study. The chapter is divided into sections according to the research questions, where each research question and its respective themes are discussed in their corresponding sections.

## 5.1 Perception of the EU ETS

During the interviews, it became evident that all respondents generally have a positive view on the EU ETS as a regulation, and view it as a measure aimed at reducing emissions within the maritime sector. As established in the theory chapter, prior research by Vierth et al. (2024) argues that the shipping industry has long been under radar in terms of comprehensive international regulation. This particular issue was something that some of the respondents emphasized during the interviews, where the maritime sector has only touched the surface in terms of facilitating sustainability. Additionally, a common topic mentioned by the respondents was that companies within the shipping industry have had ambitions to become more sustainable, but that when it comes to improving and facing sustainability issues, the ambition has been relatively minor. Consequently, it has become clear that something was required to propel development in sustainability within the shipping industry. This particular perception was a commonly shared mindset among the respondents in the study, who expressed confidence that the EU ETS will provide this well needed incentive, more specifically, an incentive for shipowners and operators to adopt more sustainable shipping practice.

When it comes to the shipper's perceptions, a common theme was that shippers and customers have shown interest in understanding how the regulation will be implemented and how it may affect their day to day business with the shipping companies. While some shippers have been quite welcoming to a regulation such as the EU ETS, and have the understanding that they have to play their part in ensuring sustainability, some shippers and customers are more critical. Some of the respondents claimed that some shippers have made complaints, more specifically claiming that they think it is unfair and not their responsibility to pay for the additional cost caused by the regulation. This is most likely something that needs to be addressed and discussed more thoroughly, where one might argue that transferring the increased cost to the shippers can counteract the overall effectiveness of the EU ETS.

## 5.2 Competition with other modes of transport

As previously established by Jonsson and Mattson (2016), sea transportation has distinguished itself as a cost effective mode of transportation for long distance transportation of low-value cargo, largely due to its significant loading capacity and low costs associated with infrastructure. This might explain why all respondents had the impression that sea transportation will, in the light of the EU ETS, be relatively unthreatened by other modes of transport. To illustrate this, one of the respondents highlighted sea transportation as the backbone of global trade, and that it is extremely difficult for other modes of transportation to compete with on a global scale. This is something that is also mentioned by the other respondents, where some claim that the current market conditions strengthens the position of sea transportation, while other respondents mention that the increase in operational costs for the shipowners is considered to be minor on a large scale, making the threat of other modes of transportation relatively weak. However, the respondents share an impression that there still is a possibility that there will be an increase in competition between sea transportation and other modes of transport when it comes to transports made within the EEA. A considerable portion

of the respondents shared this view, where if a potential modal shift were to happen, it would be within the short-sea shipping sector from sea to either rail or road. This perception is also shared by Stopford (2008) where the author identifies that the short-sea shipping sector is in direct competition with land based transportation modes, which in some ways validates the respondents views. For example, respondent 1 suggests that an increased competition with other modes of transportation can become present for feeder traffic from larger ports in Europe such as Rotterdam, to smaller ports such as Gothenburg. Meanwhile, there are also reasons to believe that this is not the case. Some respondents share some views that counter this particular argument. Respondent 1 mentions the transport volumes as a limiting factor to switching modes, where feeder vessels generally transport around 2000 TEU, which means that road transportation will not be a sufficient alternative. Another perspective is provided by respondent 2, who mentions the current political tensions and war in Ukraine as an obstacle that prevents the possibility to transport cargo to and from Asia by land-based transportation. Additionally, a recent increase in road toll in Germany might also provide benefits for sea transportation in terms of competition with road transportation, where the road toll will offset the EU ETS charge from shipping companies as suggested by respondent 3.

## 5.3 Effects on container shipping and pricing

### 5.3.1 Alternative fuels

Prior research by the IEA (2020) has shown that when it comes to "cleaner" alternative shipping fuels, the costs for the available alternatives are in many instances, too expensive to be convincingly viable for shipowners. From the interviews, this issue is mentioned exclusively by respondent 2. Because of this, it is not hard to believe that it has been proven difficult to stimulate the consumption of "clean" shipping fuels due to the high prices. This issue was something that respondent 2 expressed great emphasis on, that there are renewable shipping fuels available, but that there are, among other things, certain limitations such as lack of infrastructure that hinder the development. Can the EU ETS be the solution to this dilemma? The EU ETS might be a step in the right direction towards bridging the gap between traditional fossil and alternative fuels, but there is still room for improvement in terms of availability and infrastructure of alternative fuels. This is also something that was highlighted in a study by Christodoulou and Cullinane (2023), where the authors claim that the EU ETS will be a vital tool in expediting future investments in green technologies and alternative fuels. However, only if the additional carbon costs caused by the EU ETS are at a sufficiently high enough level, meaning, there has to be sufficient incentives for shipowners to switch to these fuels. More importantly though, the EU ETS is still, by the time of writing this study, in its initial phase. This means that those who emit are only subject to account for 40% of their emissions (European Commission, n.d.b). One can argue that this level is not sufficient enough to encourage extensive investments in sustainability, at least initially. But due to the constant increase in the level of emissions to be accounted for during the following years, being at 100% already at 2027 (European Commission, n.d.b), you could argue that it will accelerate shipping companies´adoption of long-term sustainability strategies, something that is also mentioned by Christodoulou and Cullinane (2023).

### 5.3.2 Strategies

According to Novack et al. (2018), shipping companies are subject to adapt to changes and directives arising, such as regulations. Given the nature of the EU ETS, with the intent of accelerating the ambition to facilitate and provide more sustainable shipping practices, one can argue that there are significant changes needed to be performed within a short period of time, which can be proven difficult for the actors that it affects. Based on the answers by the

respondents, shipping companies may employ different strategies to comply with the EU ETS while still managing costs and maintaining competitiveness on the market. Routing optimization was one example that was brought up, where some shipping companies alter their trade routes to include port calls outside the EEA to minimize exposure to the EU ETS regulation. This could involve using transhipment ports in regions such as the Arabian peninsula or the United Kingdom for corresponding transshipments, as mentioned by respondent 1 and 4. However, shipping companies will not be able to fully avoid the regulation if they want to operate in European waters. Due to the fact that the regulation covers 50% of emissions from voyages that start or end outside the EU (European Commission, n.d.b). Nevertheless, there are possibilities or rather, loopholes to utilize for shipping companies to save some money on certain routes. Another strategy worth mentioning, is related to the fact that the current EU ETS regulation excludes vessels under 5,000 GT (European Commission n.d.b). Because of this, there might be an incentive to sail with (more) smaller vessels. Therefore, there is room to believe that some shipping companies, especially those who operate feeder vessels, will try to benefit from this.

### 5.3.3 Pricing

Prior research by Mellin et al. (2020) has shown that the additional cost arising for shipowners from the EU ETS may be passed on to shippers, and later on, from the shippers to the consumers. This possible outcome is strengthened by the answers received from the respondents. During the interviews, it was unanimously established that all respondents and their respective companies have implemented a strategy where the additional cost caused by the EU ETS will be passed on to the shipper. Three out of the four respondents declared that the additional cost of the EU ETS will be embedded in the freight rate, which can be argued shows a lack of transparency towards the shipper. However, respondent 1 states that embedding the cost is not intended to deceive the shipper, the shipper will be aware of the additional cost, but will not necessarily know the calculations and technicalities behind it. Interestingly enough, respondent 4 and their respective company were the only ones out of the sample selection that decided to keep the additional cost clearly visible for the shipper. Who state the importance of being transparent towards the shipper. However, the fact that shipping companies transfer the additional cost onto the shipper, might be proven problematic. Based on the findings from Christodoulou et al. (2021), it is important that the shipping companies are unable to transfer the additional cost of emission allowances to make sure that the EU ETS acts as an incentive for shipowners to invest in green technology, which is more or less the intended goal of the EU ETS.

## 5.4 Method discussion

Given the character of the purpose and research questions of this study, it seemed appropriate to utilize qualitative data collection methods to properly address the perceptions and impacts of the EU ETS on European container shipping. While quantitative data could have provided some insight into the topics, such as the perception, the study seeked to understand as to why the respondents view the regulation positively, negatively or neutrally, but also to address issues in regards to effects on container shipping. Consequently, it was established by the authors that the use of quantitative data would not be feasible for this type of study and that qualitative data would be the best choice.

During the initial phases of writing this study and the writing of the theory chapter, it was important to search for appropriate literature and theory, both as a means of gaining additional knowledge about the topic but more importantly, to provide sufficient grounds for the readers to understand the result chapter. While there were a fair amount of scientific articles and

literature about the topic available, the scientific articles that were used in the theory chapter were selected based on their relevance to the themes within this study. The selection largely included choosing articles that put particular emphasis on economic impacts, the estimated effectiveness of the EU ETS and the potential changes in the pricing dynamic between a carrier and shipper. By having the authors select articles which they presumed were relevant to the study, this could be considered as a form of bias, meaning that the authors knowledge and opinions influence the choice of articles to be included in the study, which arguably can impact the reliability. This theory is also emphasized by Denscombe (2014), where the author states that when conducting research with qualitative data, the authors often become a fundamental component in terms of data collection. This means that the results of the study could therefore have turned out differently if someone else conducted the exact same research (Denscombe, 2014).

The data that constitutes the result chapter in this study is entirely based on the qualitative data that the authors received when conducting the four semi-structured interviews, and during this process, there were naturally some advantages and disadvantages associated with this method. In regards to the purpose of this study, as well as considering the time available, the authors evaluated that the study would utilize a small sample size, where the ambition was to interview a minimum of three respondents while the maximum amount was undetermined. While the small sample size can be an argument for decreased reliability of the study, one can also argue for the opposite. It was of significant importance to establish certain patterns from the interviews meaning that there were similarities between the responses, which the authors believe there were. To provide a reasonable relationship between the respondent and the purpose that the study encompasses, it was important for the authors to consider what type of respondent to be interviewed. Prior to searching for respondents, the authors declared an ambition to mainly interview shipping companies. This is due to the fact that the authors, while gaining more knowledge about the EU ETS regulation, viewed shipping companies as the most central actor in the regulation and that it is their liability to comply with the regulation, and that their responses would therefore be the most valuable compared to other types of companies. However, it became apparent that many shipping companies were hard to reach, the authors contacted shipping companies where five out of seven did not respond. While the ambition to interview mainly shipping companies was not met, utilizing other types of companies such as liner agencies and freight forwarders have proven to be valuable to the study, providing different perspectives other than that of a shipping company. Regarding the questions that were asked when conducting the semi-structured interviews, it became apparent to the authors that while the responses generally followed the same themes and, in many cases, conclusions, there could have been more questions asked during the interviews to direct the respondent in certain directions.

# 6. CONCLUSION

The aim of this study was to assess the impact of the EU ETS on the European container shipping industry, examining its effects on pricing, strategic decisions and competition with other modes of transportation. Additionally, the study aimed to determine the perception of the EU ETS from actors within the industry as well as the overall effectiveness of the regulation. The authors assert that these objectives were successfully met.

***Research Question 1: How is the EU ETS perceived by actors within the European container shipping industry?***

In conclusion, the container shipping industry has, to a great extent, a positive outlook on the extension of the EU ETS to maritime shipping. The industry acknowledges that historically, maritime shipping has been left out from comprehensive international emission regulation, meaning that the industry has been on the backfoot in terms of facilitating sustainability. A shared mindset that became evident was that something needed to be done, and that there was confidence within the industry that the EU ETS would provide an incentive to counteract these issues. Furthermore, while some shippers have been open to a regulation such as the EU ETS, some have been more critical towards the regulation and its impact on their business, claiming that it is unreasonable for them to pay for the additional cost induced by the EU ETS.

***Research Question 2: How may the EU ETS affect competition with other modes of transport?***

While there are advantages and disadvantages with each mode of transportation, the study has shown with confidence that the EU ETS will not, in significant ways and in a larger context, alter the competitive landscape. The thought that large amounts of freight will be transferred to other modes of transportation seems unimaginable. However, a potential shipping sector that is subject to face increased competition would be the short-sea sector, mainly consisting of feeder vessels. The main competitors would in such cases be with transportation by rail or road, where one of the alternatives seem more probable than the other. Considering that a typical feeder vessel is able to accommodate significantly more container units per transport than transportation by road, and a recent increase in road toll, makes the option of performing such transportations by road increasingly difficult and far from doable. With that in mind, it is concluded that if a transportation mode would take a share of the cargo volume from shipping, it would be rail transportation, although unlikely.

***Research Question 3: What effects will the EU ETS have on container shipping and how effective will the regulation be to reduce $CO_2$ emissions?***

The findings of this study indicate that multiple conclusions can be drawn about the effects of EU ETS on European container shipping and the effectiveness of the regulation. Firstly, the high costs associated with “cleaner” alternative fuels has presented a significant barrier to their implementation by shipowners. Given the findings, the EU ETS is viewed as a potential solution to bridging the cost gap between traditional fossil fuels and alternative fuels. However, the effectiveness of the EU ETS is highly dependent on several factors. These factors include, if the level of emissions to be accounted for is high enough, the extent to which shipping companies will utilize strategies to bypass the regulatory framework, and the shipping companies ability to transfer the additional cost. With regards to the level of emissions that shipping companies need to account for within the EU ETS, it can be concluded that accounting for 40% of emissions would probably not provide a significant incentive for shipping companies to adopt more sustainable practices. On the other hand, the

drastic increase of this share up until 2027 suggests that there are significant changes required in a relatively short period of time. Especially when taking factors such as the lifespan of ships into consideration, it will prove difficult for shipping companies to perform significant changes such as switching and adopting alternative fuels only during a few years time. With such issues in mind, it can be estimated that the level of emissions that shipping companies need to account for, is at a reasonable level. In terms of strategies, it can be concluded that some shipping companies will try to implement strategies to cope with the regulation, such as avoiding port calls in the EEA and instead utilizing nearby ports. Another conclusion that can be drawn from the study is that the additional cost associated with the EU ETS will be passed onto shippers, and later on, from shippers to the end-consumer.

Considering these aspects, some conclusions regarding the overall effectiveness of the EU ETS can be made. The fact that shipping companies are able to transfer the increased cost that in the end, will be pushed further down the value chain, will prove unsettling for the effectiveness of the regulation. Furthermore, considering that some shipping companies are trying to find ways to avoid the cost, it raises questions regarding the shipping industry's actual ambition to make extensive investments and improvements in sustainability. Meanwhile, it is worth mentioning that as a shipping company, implementing more sustainable practices early on, could create a compelling competitive advantage, especially when acknowledging the drastic increase in the level of emissions to be accounted for in the future, compared to the initial levels. Finally, considering these opportunities and challenges, you can come to the conclusion that there is no doubt that the EU ETS will definitely have an impact on the European container shipping industry, but how effective the regulation will become in reaching its purpose, is questionable.

# 7. RECOMMENDATIONS FOR FURTHER RESEARCH

Given the findings of this study, the authors have some recommendations for further research that can be performed about the topic. Considering this study is relatively hypothetical, performing further studies regarding the effects of the EU ETS and its effectiveness on container shipping, or shipping in general would be of great interest in the future where the impacts can be measured more definitely. Another important aspect that would be of interest could for example be investigating the shippers perspectives more thoroughly, to get an even greater perspective of the effects that the regulation may introduce.

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# APPENDIX

## Interview Questions (Appendix 1)

**Perception of EU ETS**

- What do you know about and how do you view the EU ETS regulation?
- Do you have any positive/negative/neutral opinions about the regulation?
- Have your customers/other stakeholders you work with reacted to the regulation in any way?

**Consequences of EU ETS**

- What consequences do you anticipate the regulations will have on container shipping as a whole?
- From a short-term perspective, who do you believe will bear the increased costs associated with EU ETS?

**Competition with other modes of transportation**

- In connection with the regulations, do you see increased competition or threats from other modes of transportation such as road and rail transport?

**Strategies - present and future**

- Have you observed any specific strategies or actions taken by yourselves or other market players in response to EU ETS?

## Letter of Consent (Appendix 2)

Samtycke och information om behandling av personuppgifter i studentarbete

Jag samtycker till att mina personuppgifter i form av:

- för-och efternamn
- yrkestitel
- ljudupptagning

får behandlas av Chalmers tekniska högskola för studien:

**Extension of the EU Emission Trading System to Maritime Transportation**
Assessing the perception and impacts on the European container shipping industry

JOEL HELJEMO
DANIEL LARSSON

Department of Mechanics and Maritime Sciences
Chalmers University of Technology

**Om studien**

Studien syftar till att undersöka hur aktörer inom containersjöfarten uppfattar EU ETS som regelverk, regelverkets potentiella inverkan på den Europeiska containersjöfarten samt regelverkets generella effektivitet i att reducera utsläpp av $CO_2$. I förhållande till syftet har tre frågeställningar formulerats:

1. Hur uppfattas EU ETS av aktörer inom den Europeiska containersjöfarten och hur kan de anpassa sig?
2. Hur kan EU ETS påverka konkurrensen med andra transportmedel?
3. Vilka effekter kommer EU ETS att ha på containersjöfarten och hur effektiv kommer regelverket vara i att reducera utsläpp av $CO_2$?

**Information**

Personuppgifterna kommer att hanteras på följande sätt:

- Din yrkestitel kommer att nämnas i examensarbetet
- Ditt för- och efternamn kommer inte att nämnas i rapporten och de kommer inte att delas med personer utanför Chalmers.
- Lagring av personuppgifter kommer att ske tills studien är genomförd och godkänd av examinator, senast 2024-06-07.

Ditt samtycke gäller tills vidare. Du har rätt att när som helst ta tillbaka ditt samtycke. Detta gör du genom att kontakta antingen

- Joel Heljemo på Telefon: 0725618116 eller mejl: heljemo@student.chalmers.se
- Daniel Larsson på Telefon: 0707552293 eller mejl: larssda@chalmers.se
- eller registrator@chalmers.se.

Om du återkallar ditt samtycke kommer vi upphöra att behandla personuppgifter vi samlat in med stöd i ditt samtycke. Vissa uppgifter kan komma att sparas pga. Chalmers skyldigheter enligt svensk arkivlagstiftning.

Chalmers tekniska högskola, 412 96 Göteborg, med org. nr 556479-5598 är personuppgiftsansvarig. Du hittar Chalmers integritetspolicy på www.chalmers.se.

Som registrerad har du rätt att få information om hur dina personuppgifter behandlas. Du har rätt att få felaktiga uppgifter rättade, överflödiga uppgifter raderade, begära att behandlingen begränsas och uppgifter överförda till en annan aktör. Du har även rätt att lämna klagomål till Integritetsskyddsmyndigheten (IMY). Har du frågor rörande Chalmers behandlingar av personuppgifter kan du kontakta Chalmers dataskyddsombud på dataskydd@chalmers.se.

Jag samtycker till att Chalmers tekniska högskola behandlar personuppgifter om mig i enlighet med ovanstående.

| | |
|---|---|
| Ort | Underskrift |
| Datum | Namnförtydligande |

**DEPARTMENT OF MECHANICS AND MARITIME SCIENCES**
**CHALMERS UNIVERSITY OF TECHNOLOGY**
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